
Updates on Modeling Framework and Emissions Inventory

STMPR Advisory Group Meeting
August 20, 2020

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Current and Upcoming SIP Revisions/AQMP

2020 SIP Revisions

- 2006 24-hour PM_{2.5} plan for the South Coast Air Basin (SCAB)
- 1997 8-hour ozone plan for the Coachella Valley

2022 AQMP

- 2015 8-hour ozone plan for the South Coast Air Basin and Coachella Valley



South Coast Air Basin PM2.5 Attainment Status

PM2.5 National Ambient Air Quality Standards

Standard	Level	Attainment Deadline	South Coast Attainment Status
1997 Annual PM2.5	15 $\mu\text{g}/\text{m}^3$	2015	Attained in 2013
1997 24-hour PM2.5	65 $\mu\text{g}/\text{m}^3$	2015	Attained in 2013
2006 24-hour PM2.5	35 $\mu\text{g}/\text{m}^3$	2019	Serious Nonattainment
2012 Annual PM2.5	12 $\mu\text{g}/\text{m}^3$	2025	Serious Nonattainment



Coachella Valley Ozone Attainment Status

Federal Ozone National Ambient Air Quality Standards

Standard	Level	Attainment Deadline	South Coast Attainment Status
1979 1-hour Ozone	0.12 ppm	11/15/2007	Attained 12/31/2013
1997 8-hour Ozone	0.08 ppm	6/15/2024	Extreme Nonattainment
2008 8-hour Ozone	0.075 ppm	7/20/2027	Severe Nonattainment
2015 8-hour Ozone	0.070 ppm	8/3/2033	Severe Nonattainment



2020 SIP Revisions – SCAB PM2.5 Plan

SCAB failed to attain the 2006 24-hour PM2.5 standard by 2019

A SIP revision is required to demonstrate attainment as expeditiously as possible or no later than 5 years from EPA's final action on failure to attain

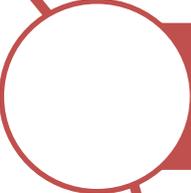
New attainment date is September 2025* or earlier

The plan is due to EPA by December 31, 2020

*New attainment date counts from the date EPA finalizes the finding of failure to attain. EPA has not finalized it yet, but is expected to be August – September, 2020.



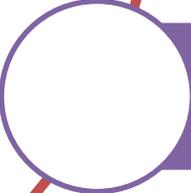
2020 SIP Revisions – Coachella Valley Ozone Plan



Coachella Valley was reclassified from “severe” to “extreme” nonattainment area for the 1997 8-hour ozone standard in 2020



New attainment date is June 2024 or earlier



The plan is due to EPA by Feb 14, 2021



Modeling Framework for 2020 SIP Revisions

1. Based on 2016 AQMP Modeling and Emissions Inventory
2. Baseline Year
 - Modeling year: 2018
 - PM_{2.5} mass Design Value: 2015-2019
 - PM speciation data: 2016-2018
 - Near-road monitored PM concentration
3. Meteorological modeling
 - WRF Version 4.0.3
 - NCEP NARR* Re-analysis (32 km X 32 km)
 - Update Sea Surface Temperature every 6 hours using GODAE data



CMAQ Modeling

- CMAQ version v5.0.2
 - SAPRC07 gaseous mechanism
 - AERO6 aerosol module
- MEGAN version v3.0 for biogenic emissions
- SCAB PM2.5 modeling: January 1 – December 31, 2018
- CV ozone modeling: May 1 – September 30, 2018
- Future attainment year: 2023

Updated Emissions Inventory for 2020 SIP Revisions

Point Sources

- 2018 AER

Area Sources

- 2016 AQMP

On-Road Mobile

- 2016 RTP
Traffic
Activity Data
- EMFAC2017
Emissions
rate

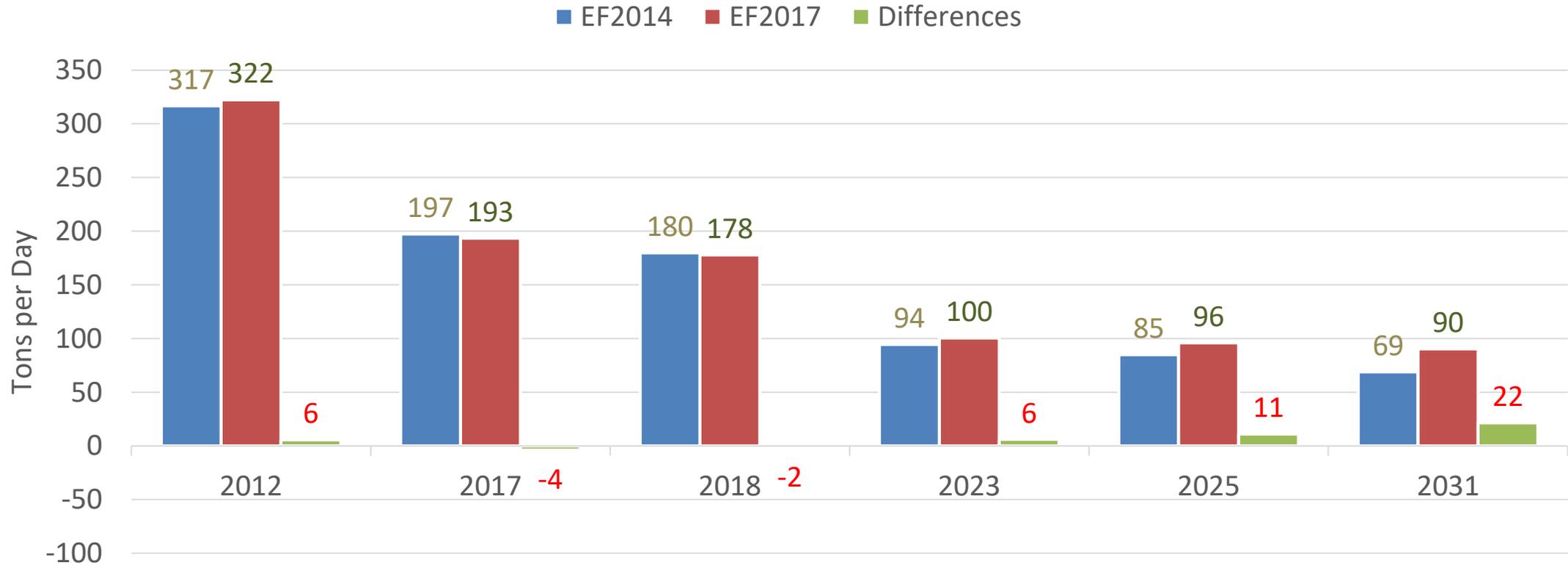
Off-Road Mobile

- 2016 AQMP
- OGV updates
from 2018
SIP update



EMFAC 2014 vs 2017

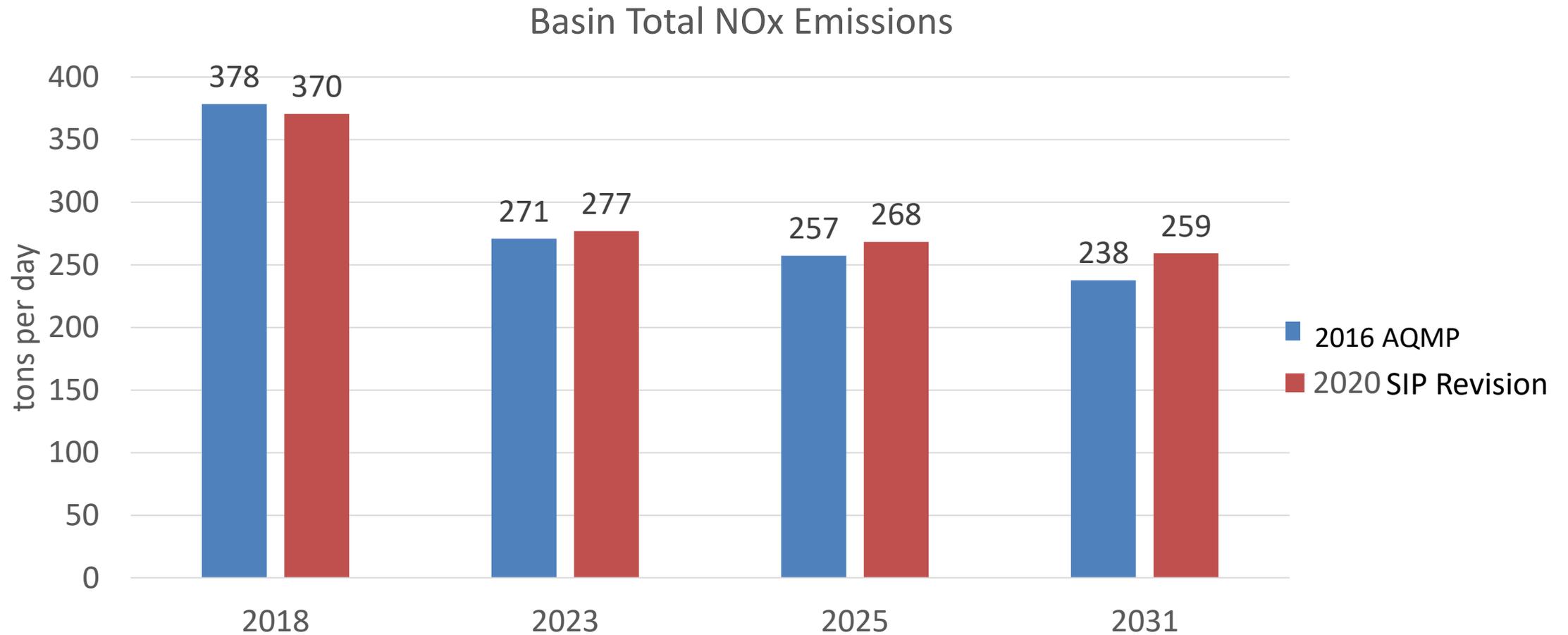
Annual Average NOx emissions for the SCAB



(Based on travel Activity Data from 2016 AQMP)

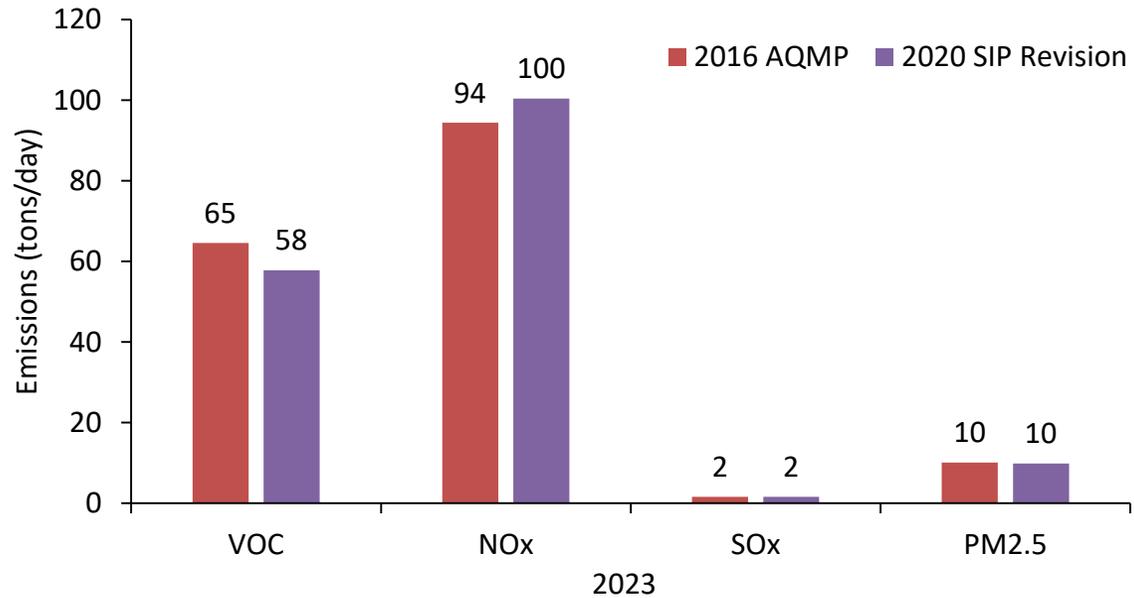


Annual Average Emissions

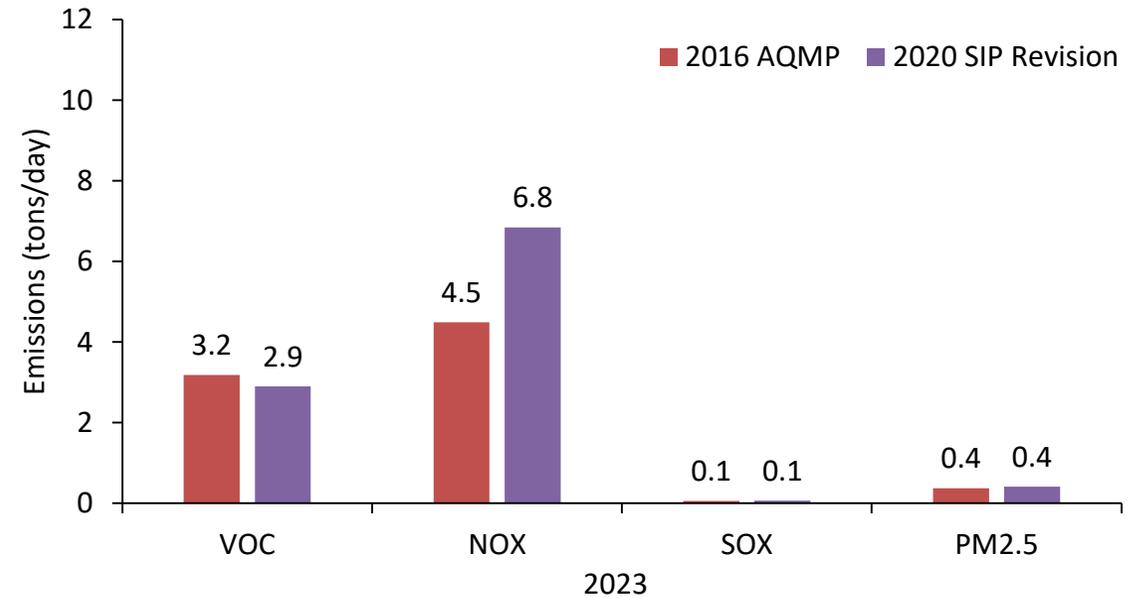


Emissions Comparison: 2016 AQMP vs 2020 Revision

SCAB

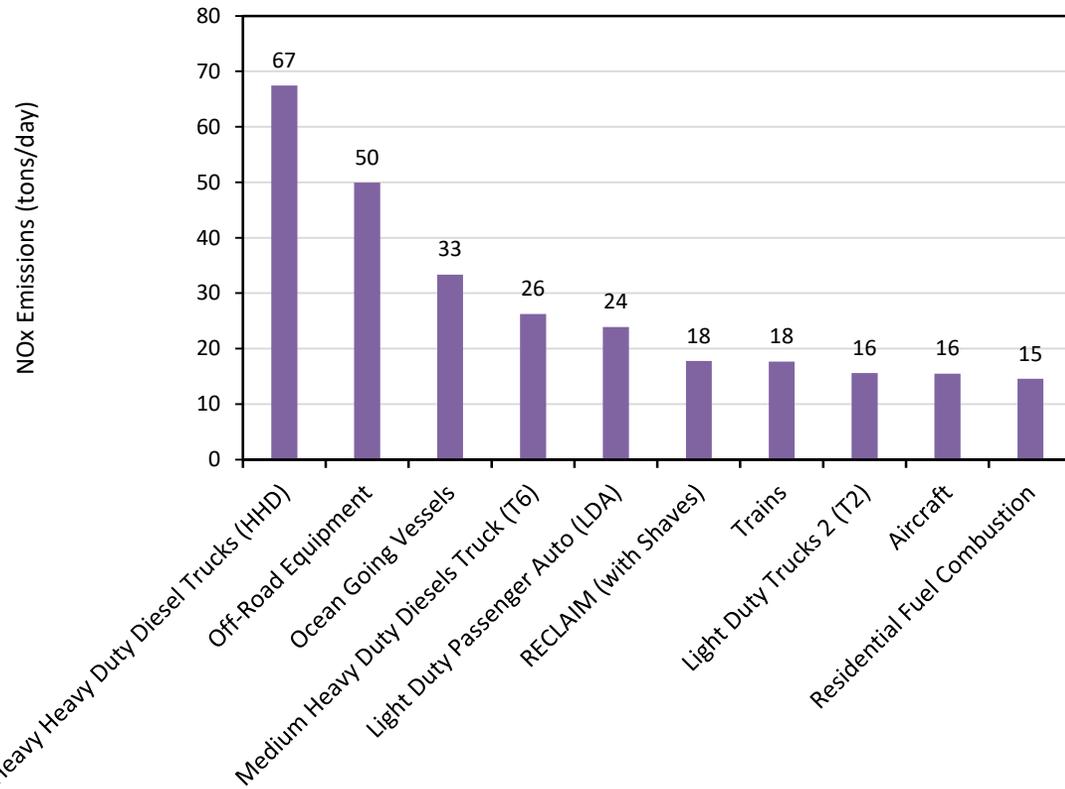


Coachella Valley

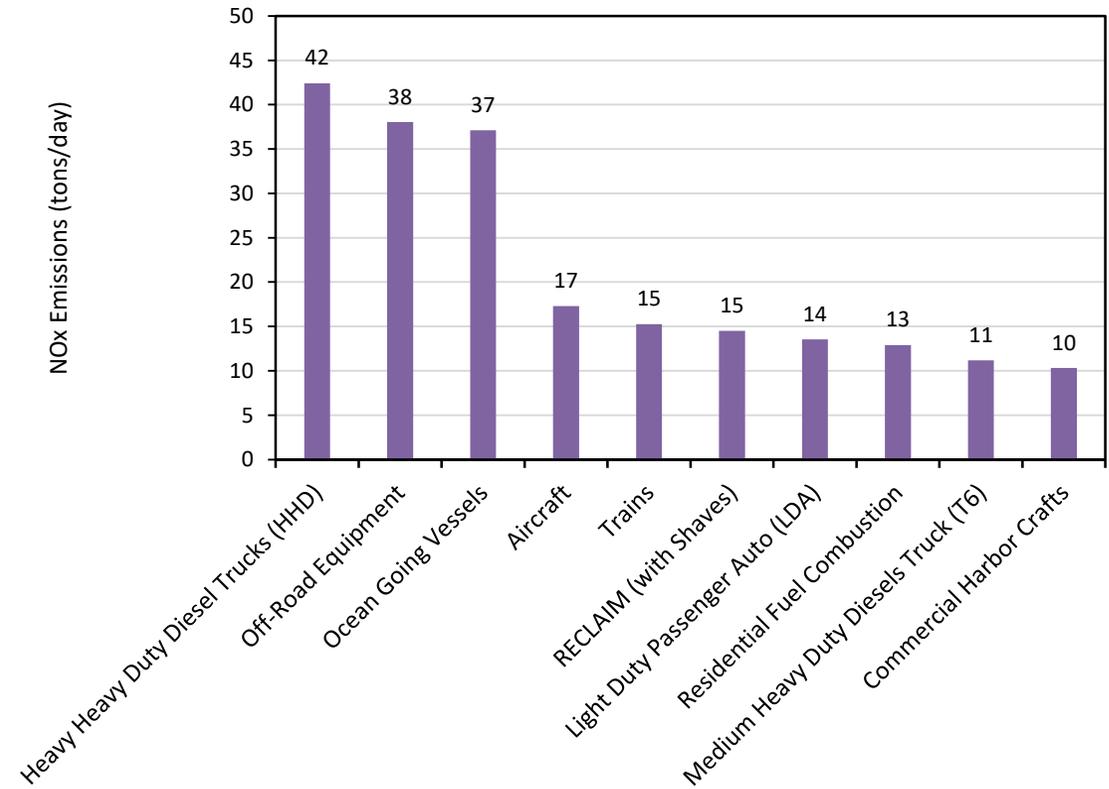


Top Ten NOx Sources in SCAB: 2018 vs 2023

2018

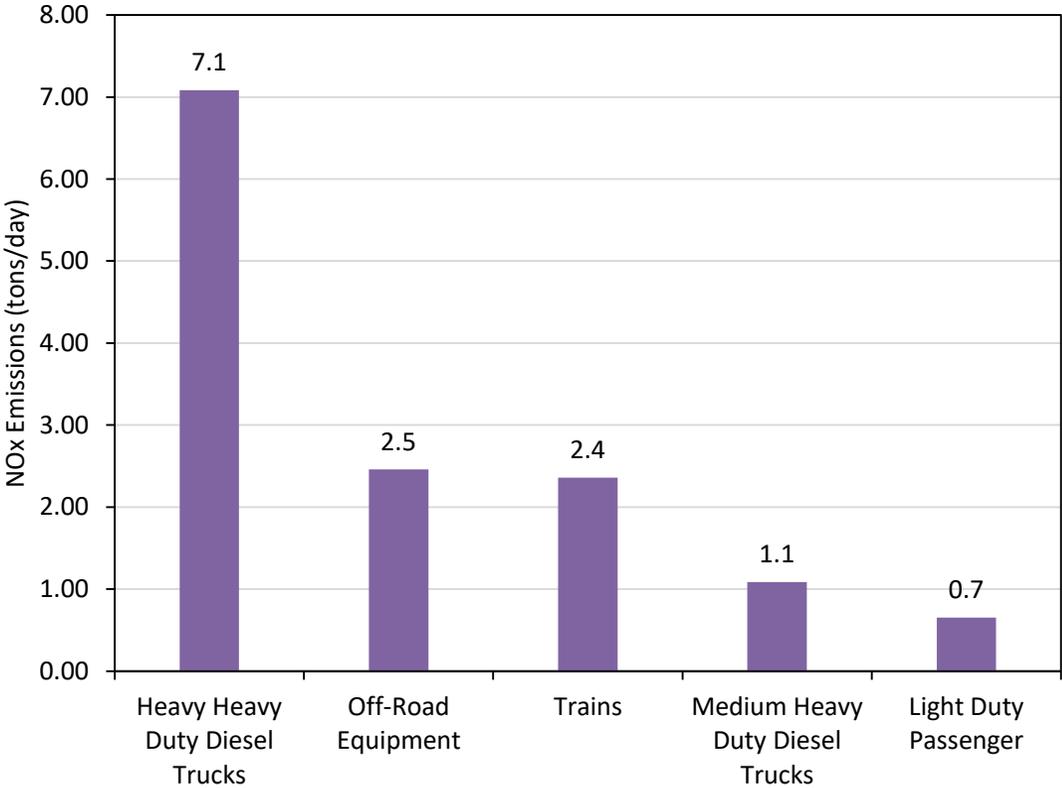


2023

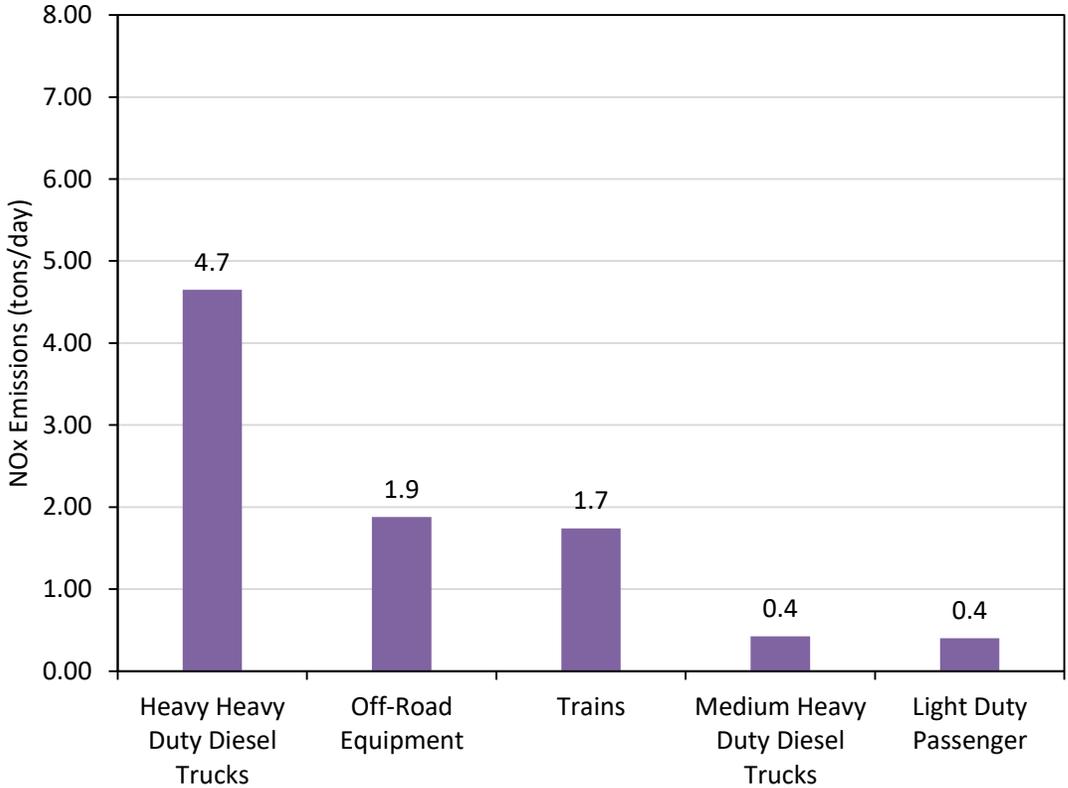


Top Five NOx Emission Sources in CV: 2018 vs 2023

2018



2023



2006 24-hour PM_{2.5} NAAQS Attainment Demonstration for the South Coast Air Basin

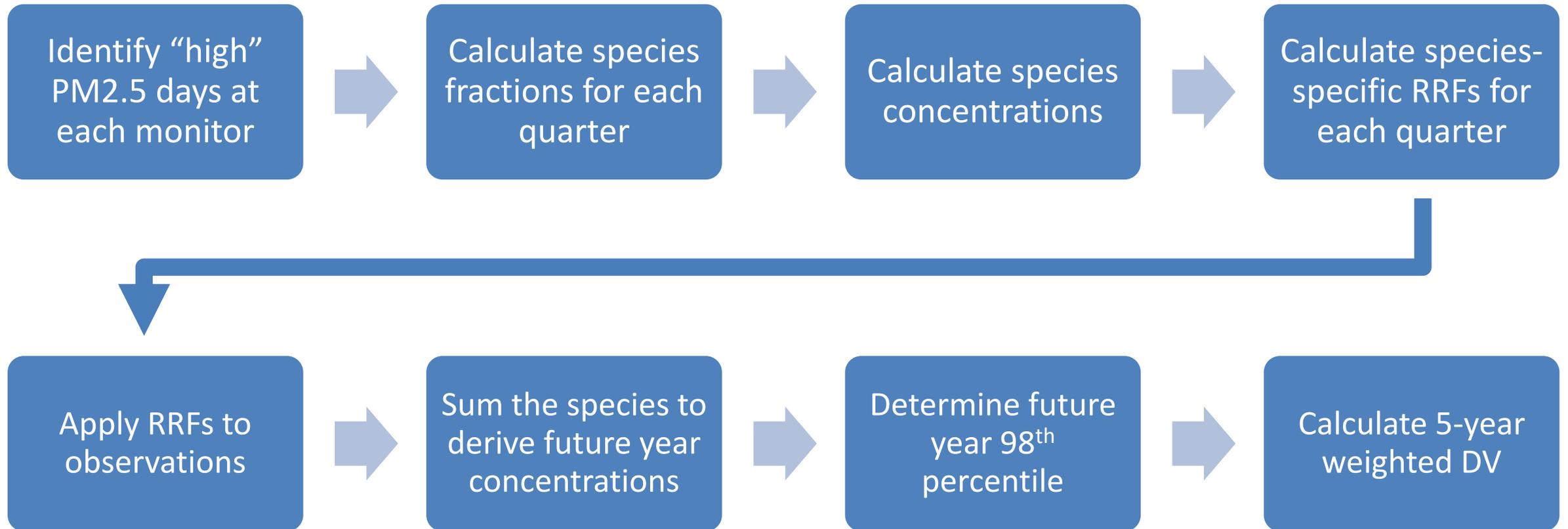
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EPA's Guidance to Demonstrate 24-hour PM2.5



PM2.5 Measurement Data

PM2.5 Federal Reference Method (FRM) mass

Five-year period from 2015 to 2019

16 locations meet data requirement for a valid DV for the period

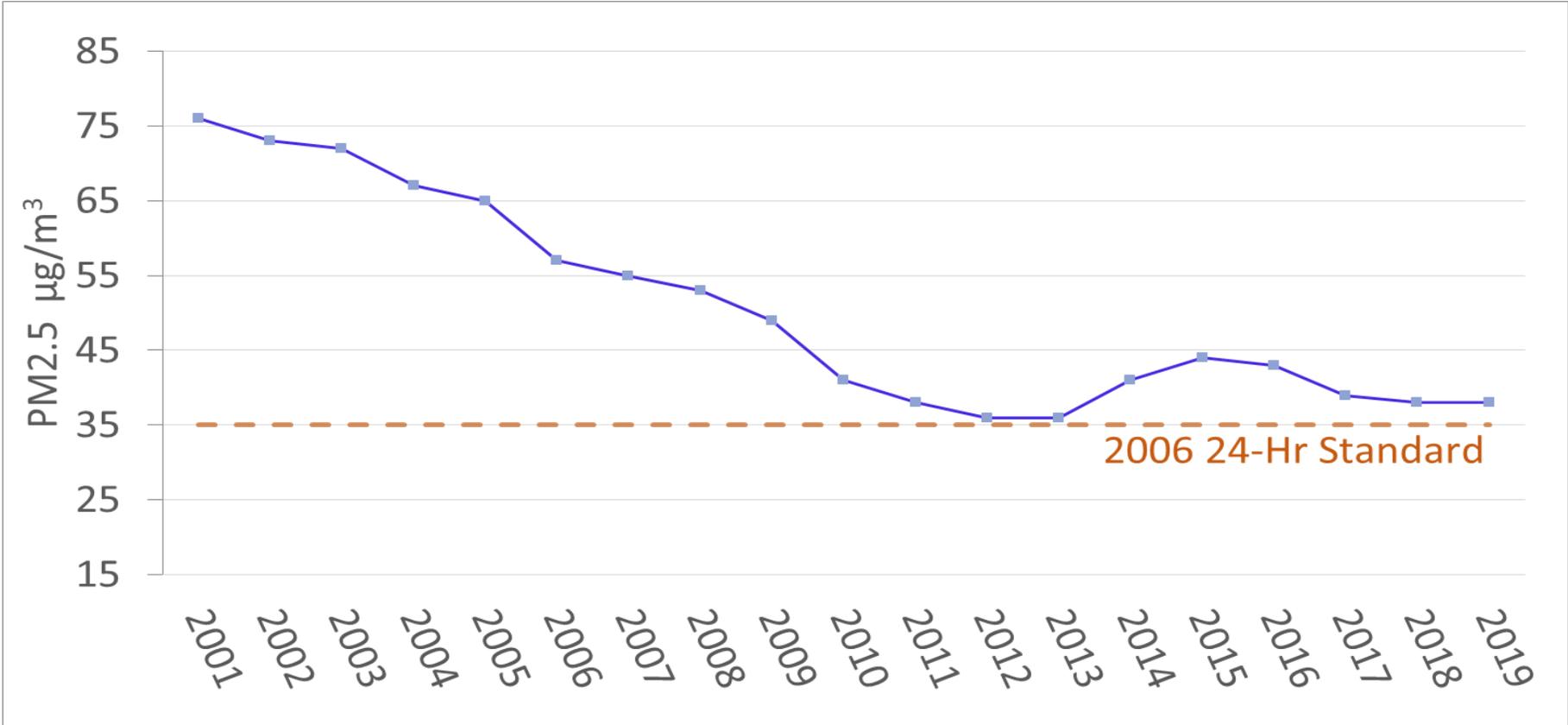
PM2.5 composition from Chemical Speciation Network (CSN)

Latest available three-year period, 2016-2018

Four locations, one location per county



SCAB 24-hour PM2.5 3-year Design Values



Five-year Weighted 24-hour PM2.5 Design Values (DV)

Monitoring Site	2016 AQMP DV (weighted average for 2010-2014)	Current DV (weighted average for 2015-2019)
Anaheim	26.0	N/A*
Azusa	-	26.0
Big Bear	-	20.3
Compton	-	38.3
Fontana	32.7	29.3
Long Beach – Hudson	-	28.5
Long Beach – South	-	28.6
Long Beach – Near Road	-	32.3

*Measurements did not satisfy data completeness criteria

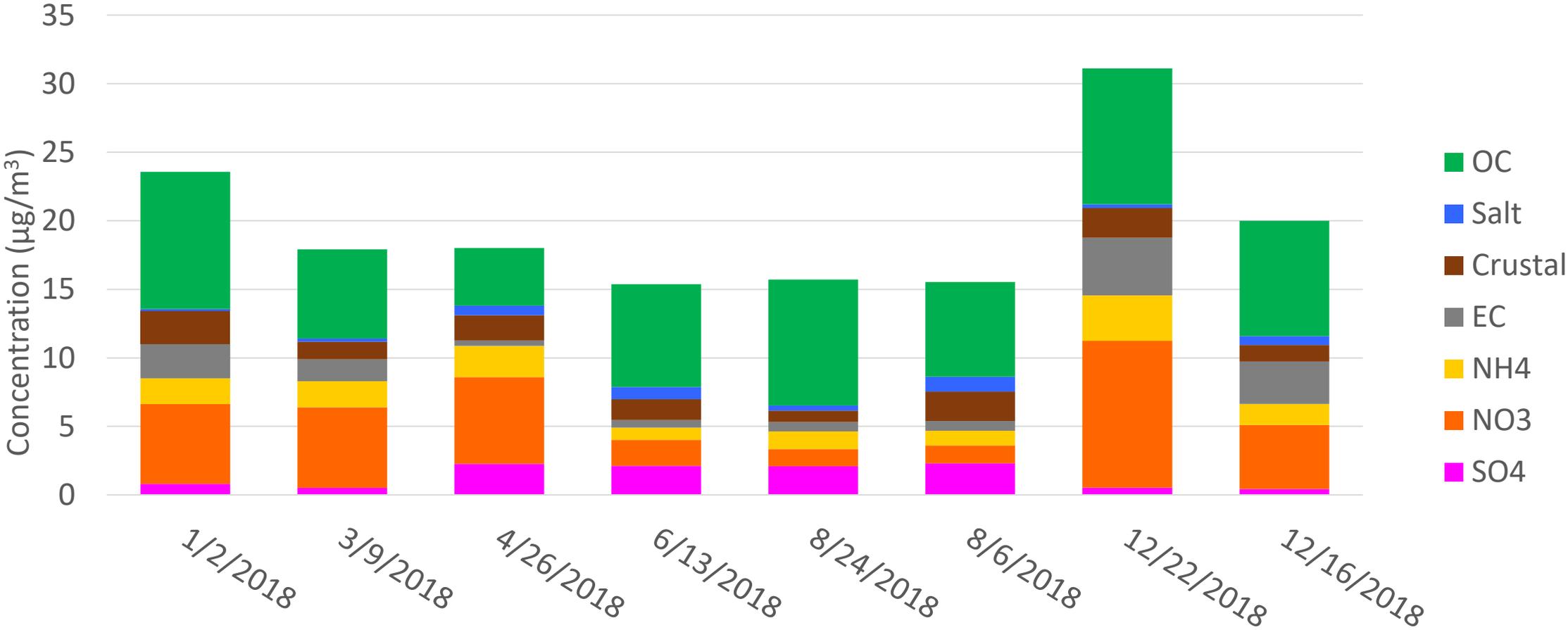


Five-year Weighted 24-hour PM2.5 Design Values (DV) (cont'd)

Monitoring Site	2016 AQMP DV (weighted average for 2010-2014)	Current DV (weighted average for 2015-2019)
Los Angeles	31.0	30.6
Mira Loma	36.7	37.3
Mission Viejo	-	15.8
Ontario – Near Road	-	34.3
Pasadena	-	25.1
Pico Rivera	-	30.9
Reseda	-	23.7
Riverside Rubidoux	33.0	31.4
San Bernardino	-	28.2

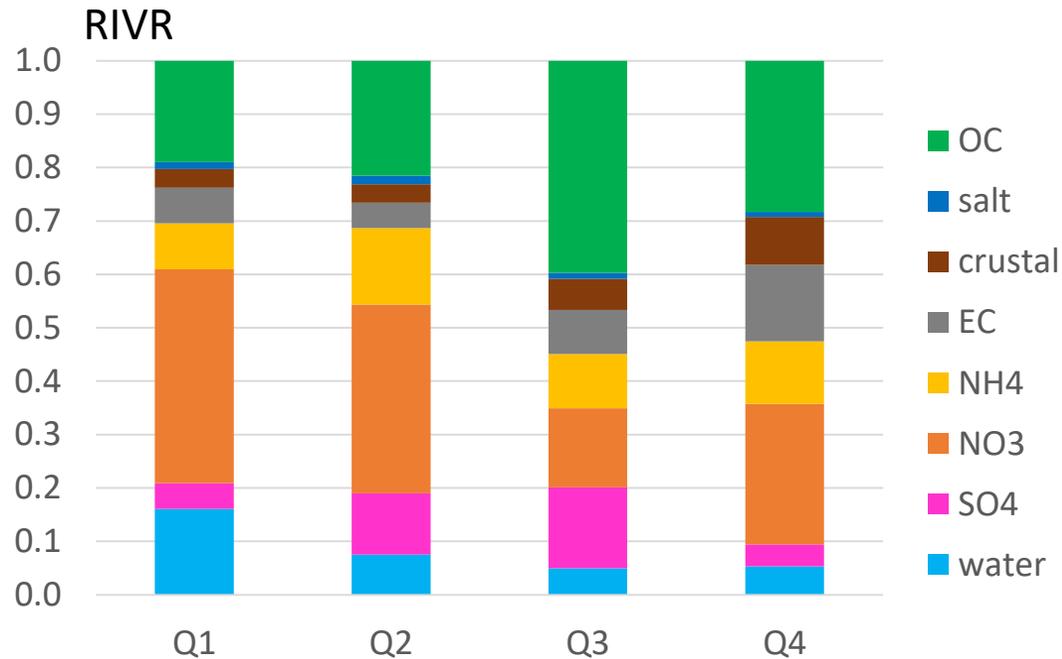


Rubidoux Quarterly Top 2-day 24-hour PM2.5 Mass and Chemical Components in 2018

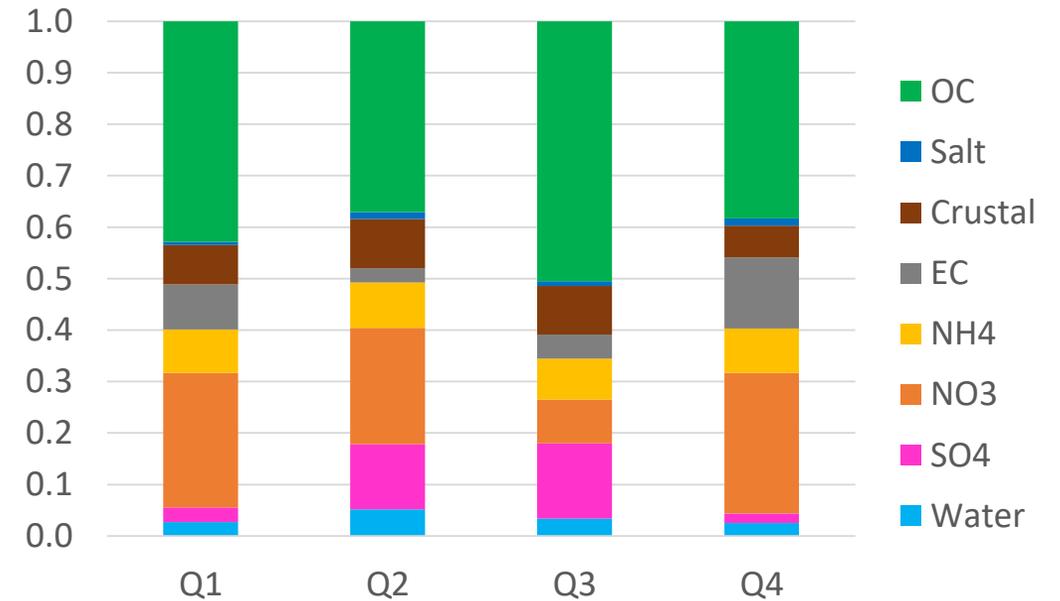


Speciation Fractions: 2012 vs 2018

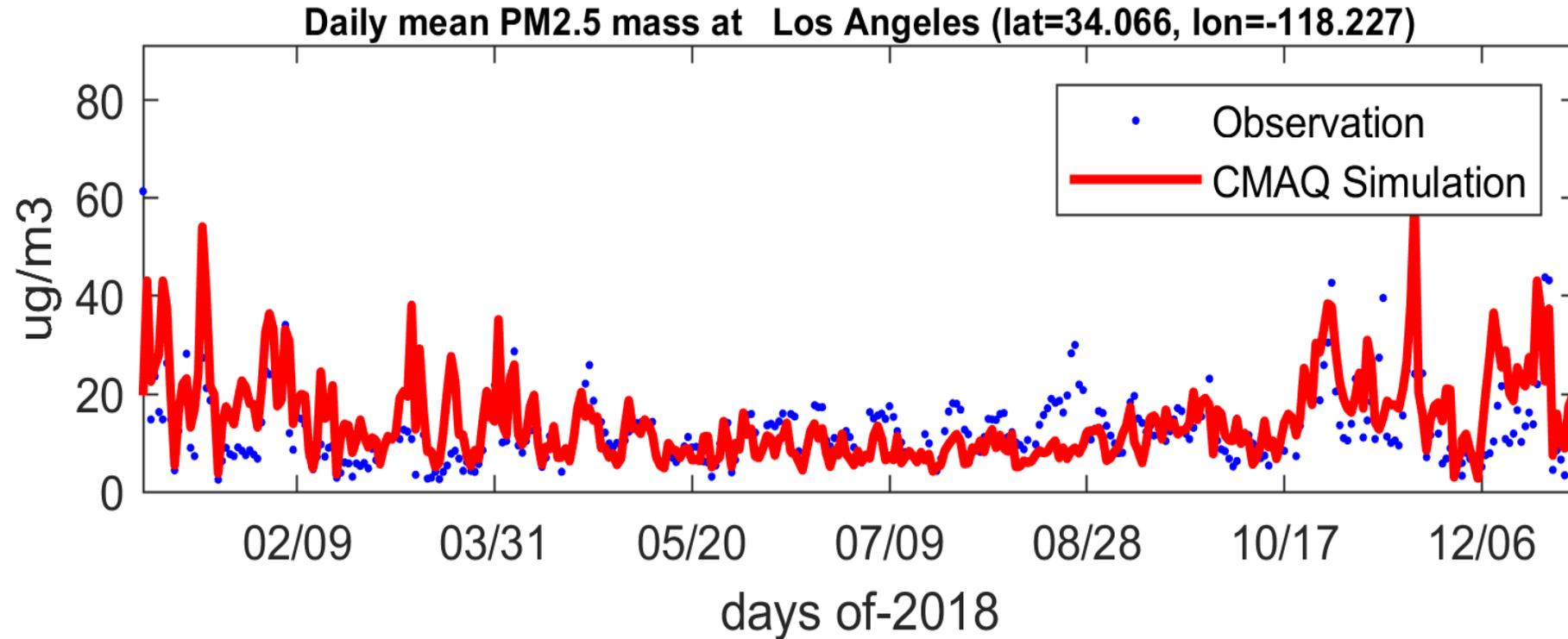
2016 AQMP (2012)



2020 SIP Revision (2018)

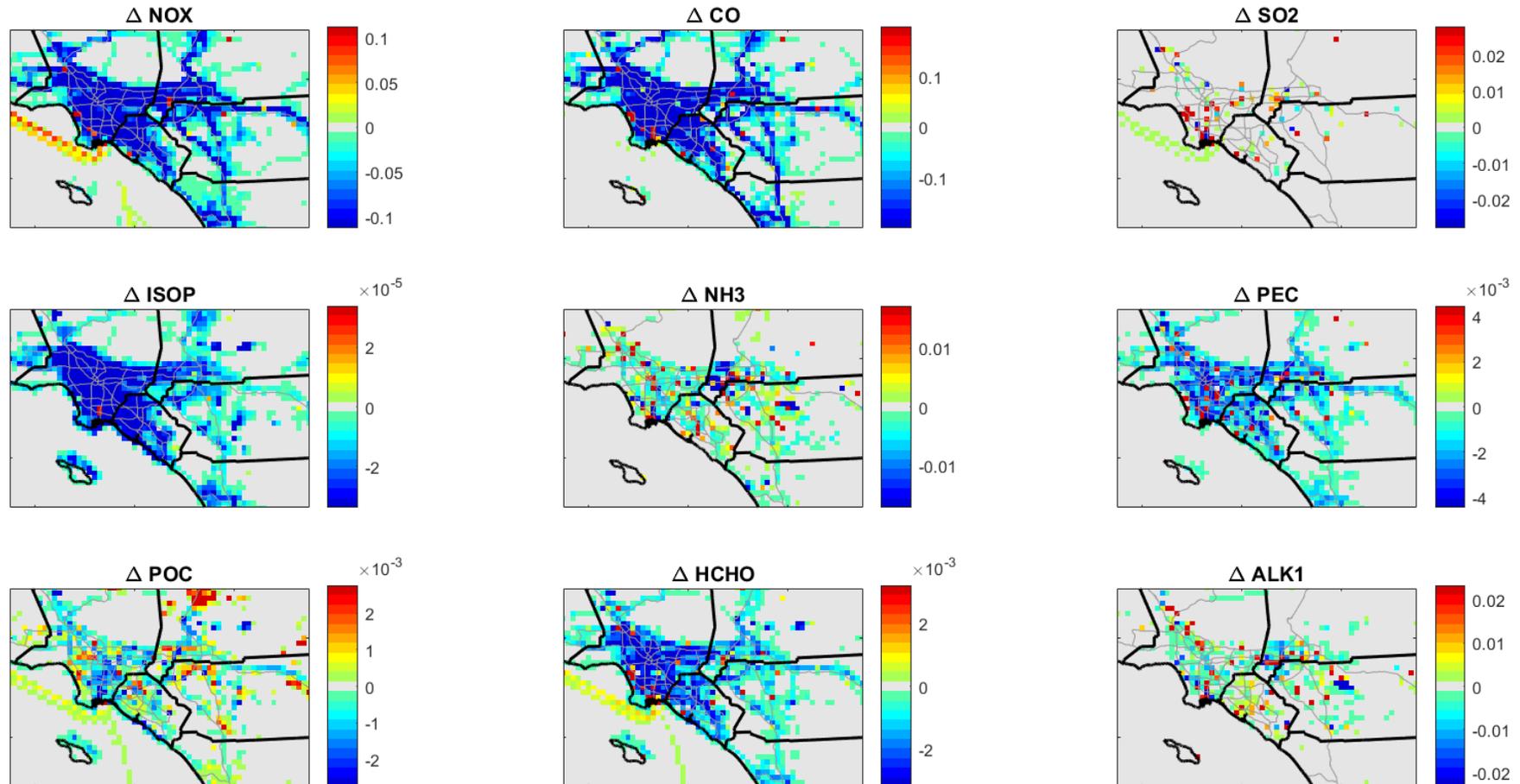


PM2.5 mass at LA location



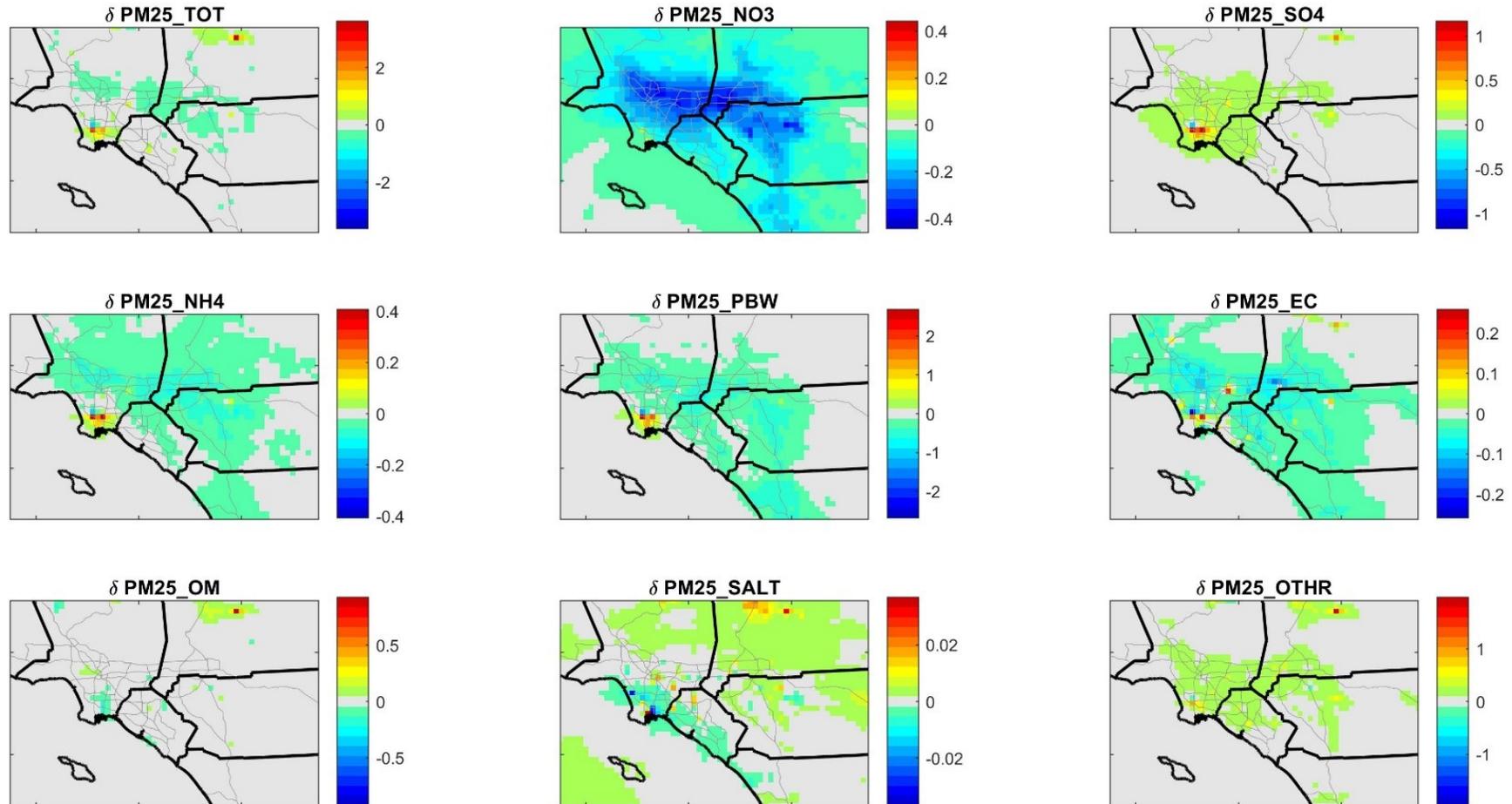
2023 vs 2018 Emissions Scenario

2023 minus 2018 (annual mean, tons/day)



2023 vs 2018 CMAQ results

2023 minus 2018 (annual mean, ug/m3)
'Baseline 2023' minus 'Baseline 2018 AER NH3'



Design Values in the Base and Future Years

Station	2018 Baseline	2023 Baseline
Azusa	26.0	24.6
Big Bear	20.3	18.2
Compton	38.3	38.2
Fontana	29.3	27.9
Long Beach – Hudson	28.5	28.6
Long Beach – South	28.6	28.9
Long Beach – Near Road	32.3	32.5

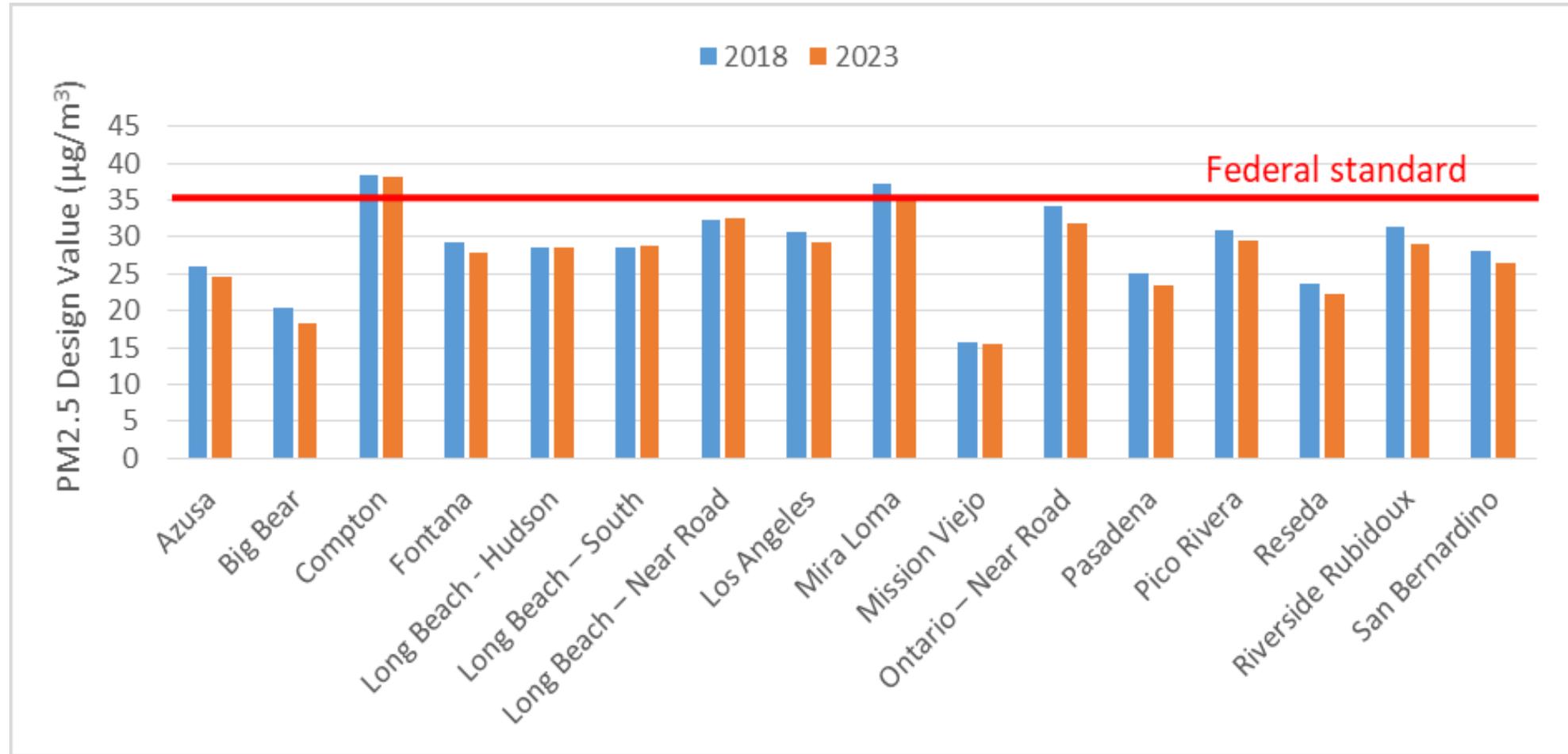


Design Values in the Base and Future Years (cont'd)

Station	2018 Baseline	2023 Baseline
Los Angeles	30.6	29.3
Mira Loma	37.3	34.9
Mission Viejo	15.8	15.5
Ontario – Near Road	34.3	31.8
Pasadena	25.1	23.5
Pico Rivera	30.9	29.5
Reseda	23.7	22.3
Riverside Rubidoux	31.4	29.1
San Bernardino	28.2	26.4



Design Values in the Base and Future Years (Cont'd)



Attainment Demonstration

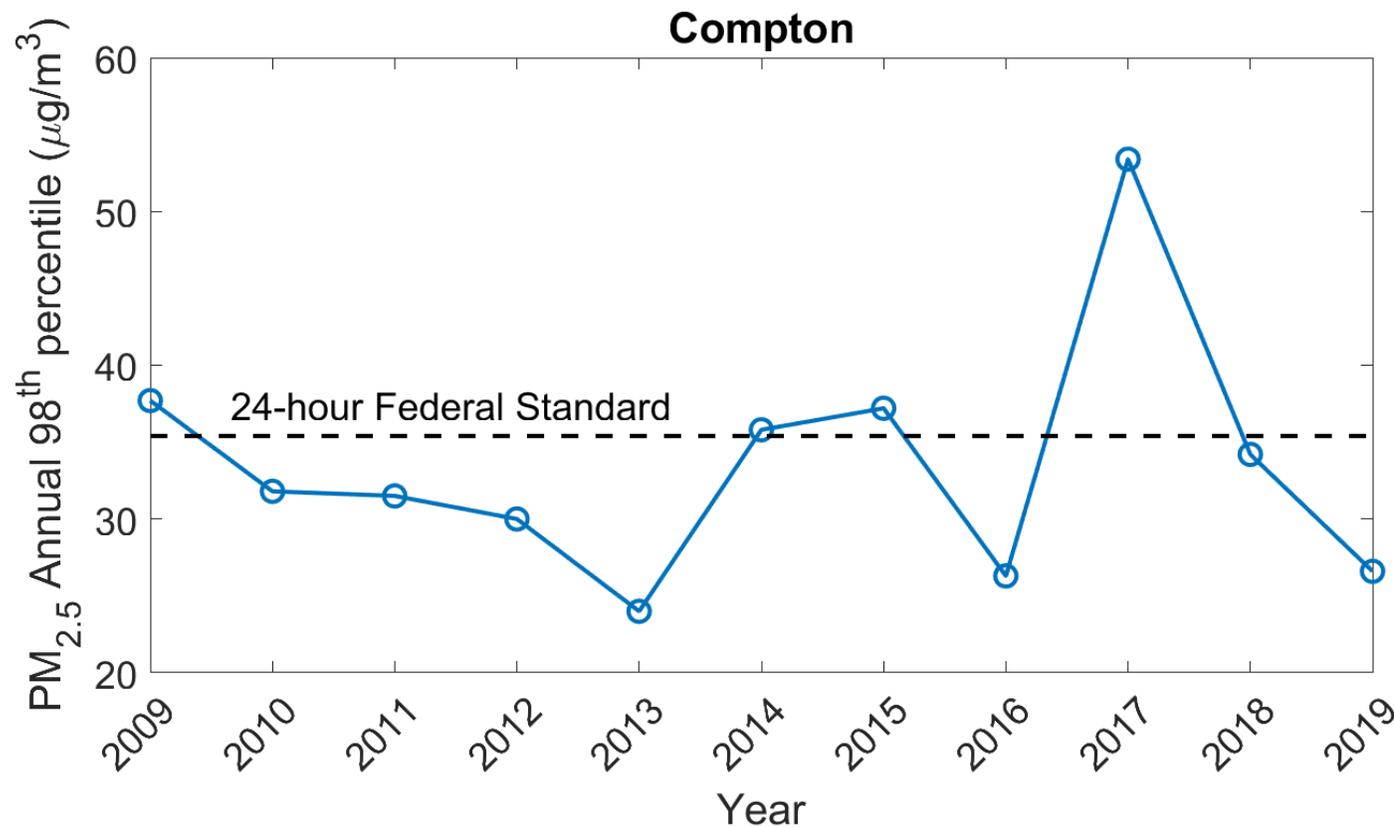
- Two-Fold Hybrid Approach
 - **Mira Loma and all stations other than Compton**
 - Traditional Approach - Updated emissions inventory/regional air quality modeling
 - **Compton**
 - Supplemental weight of evidence and air quality trend analysis based on monitoring data

Attainment Demonstration – Mira Loma and all stations other than Compton

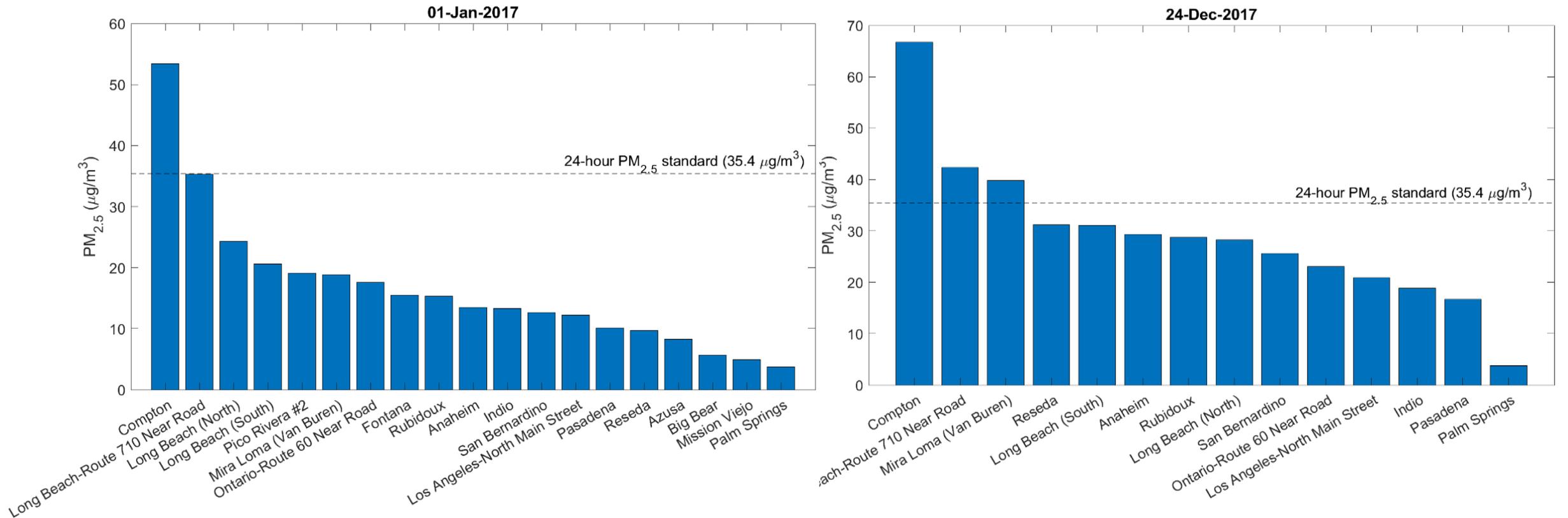
- Traditional Approach - Updated emissions inventory/regional air quality modeling
 - Preliminary analysis indicates attainment with baseline emissions (existing regulations) with recently adopted regulations providing further assurances
 - Driven mostly by NO_x reductions needed to attain federal ozone standards
- Preliminary 2020 design value (years 2018-2020) to date shows that Mira Loma will attain by the end of 2020, if no more than 4 days above 35.5 ug/m³ for rest of year (Nov/Dec)

Air Quality in Compton

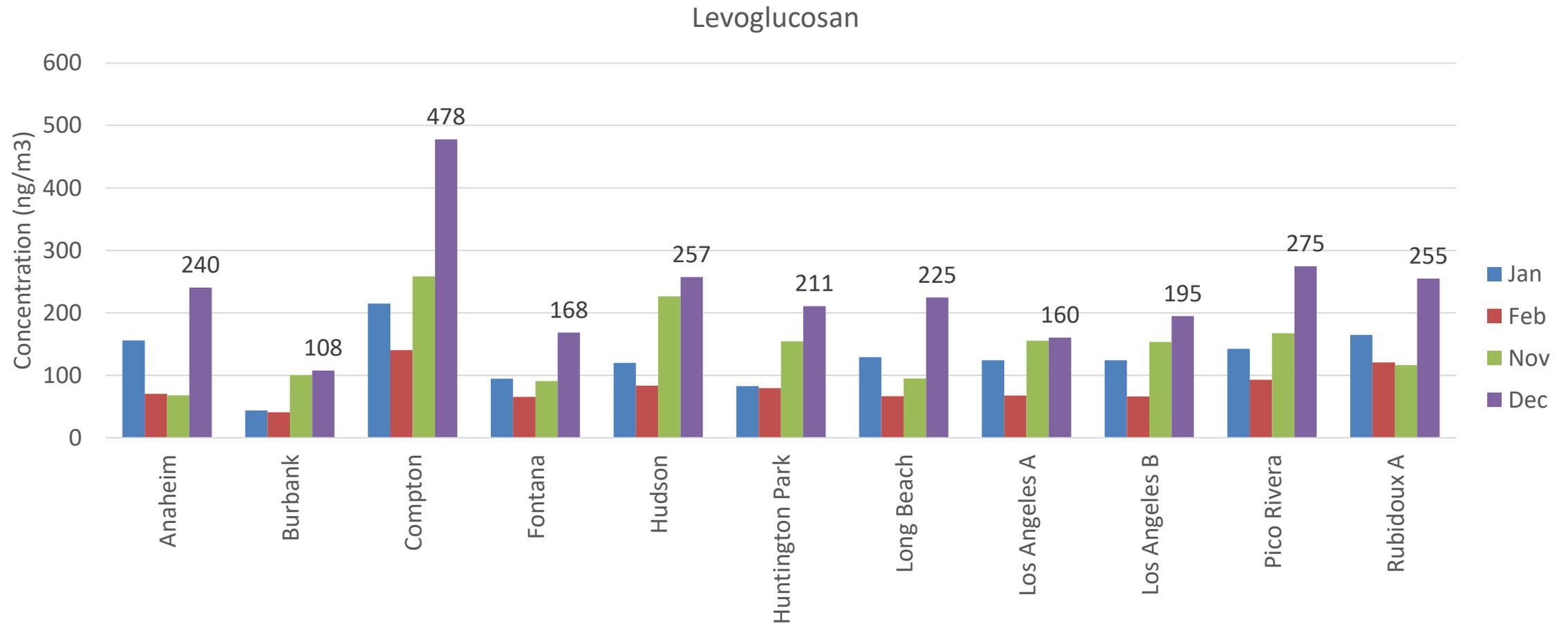
- Ambient data in Compton shows a sharp increase in 2017 only and lower PM_{2.5} levels prior to and after 2017.



PM_{2.5} levels in the Basin on Compton's high PM days



Levogluconan Concentration



Emissions Inventory and Modeling Sensitivity in Compton

	2018 Baseline	2023 Baseline
Compton Design Value ($\mu\text{g}/\text{m}^3$)	38.3	38.2
Basin Total NOx Emissions (Tons per Day)	371	277
Basin Total VOC Emissions (Tons per Day)	369	352

- High PM episodes observed in 2017 were likely driven by anomalous human activities which are not reflected in the emissions inventory
- If local emissions causing non-attainment are unknown, difficult to develop an effective control strategy
- Traditional control strategy for Compton would require unrealistic levels of regional emissions reductions and may not be effective



Attainment Demonstration – Compton

- A suite of supplemental analysis to use as weight of evidence, as suggested in EPA's guidance
 - Ambient monitoring data
 - Trend of emissions inventory
 - Additional reductions from recently adopted and proposed regulations
 - Analyzing other factors, such as local meteorology, fireworks, wood burning that can lead to high PM events
- Preliminary 2020 design value (years 2018-2020) to date is well below the standard, indicating Compton will attain the standard by the end of 2020, if no more than 7 days above 45 ug/m³ for rest of year, which is very unlikely



Summary and Conclusion

- Regional modeling platform and emissions inventory for the SCAB have been updated with latest available model versions and emissions data
- Two-fold hybrid approach is proposed to demonstrate attainment
 - Traditional chemical transport modeling for all the stations except Compton
 - Weight of evidence approach for Compton
- South Coast Air Basin is expected to attain the 2006 24-hour PM_{2.5} standard in 2023 with reductions from continued implementation of existing regulations (one year earlier than the attainment deadline)



1997 8-hour Ozone NAAQS Attainment Demonstration for the Coachella Valley

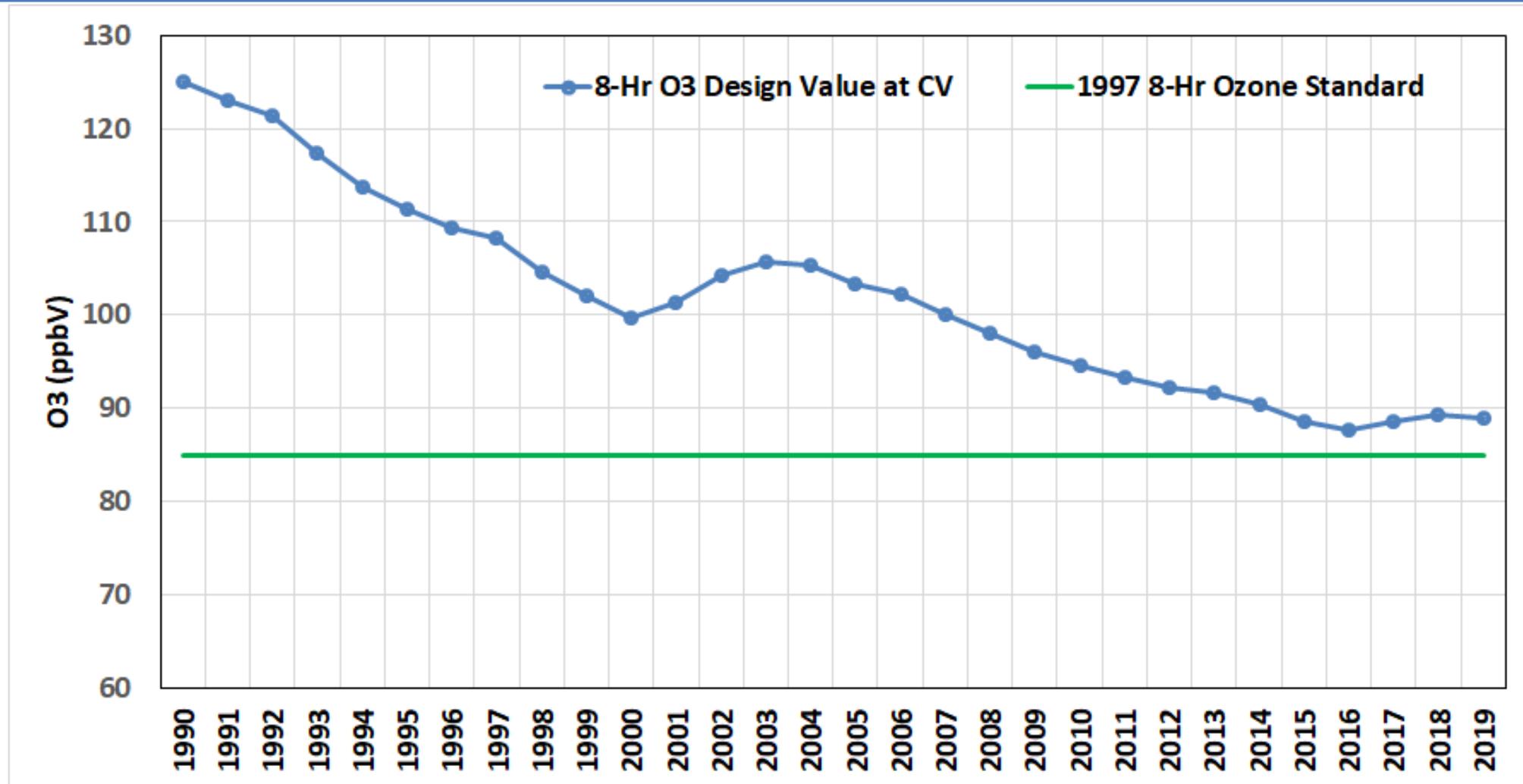
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8-hour Ozone Design Values

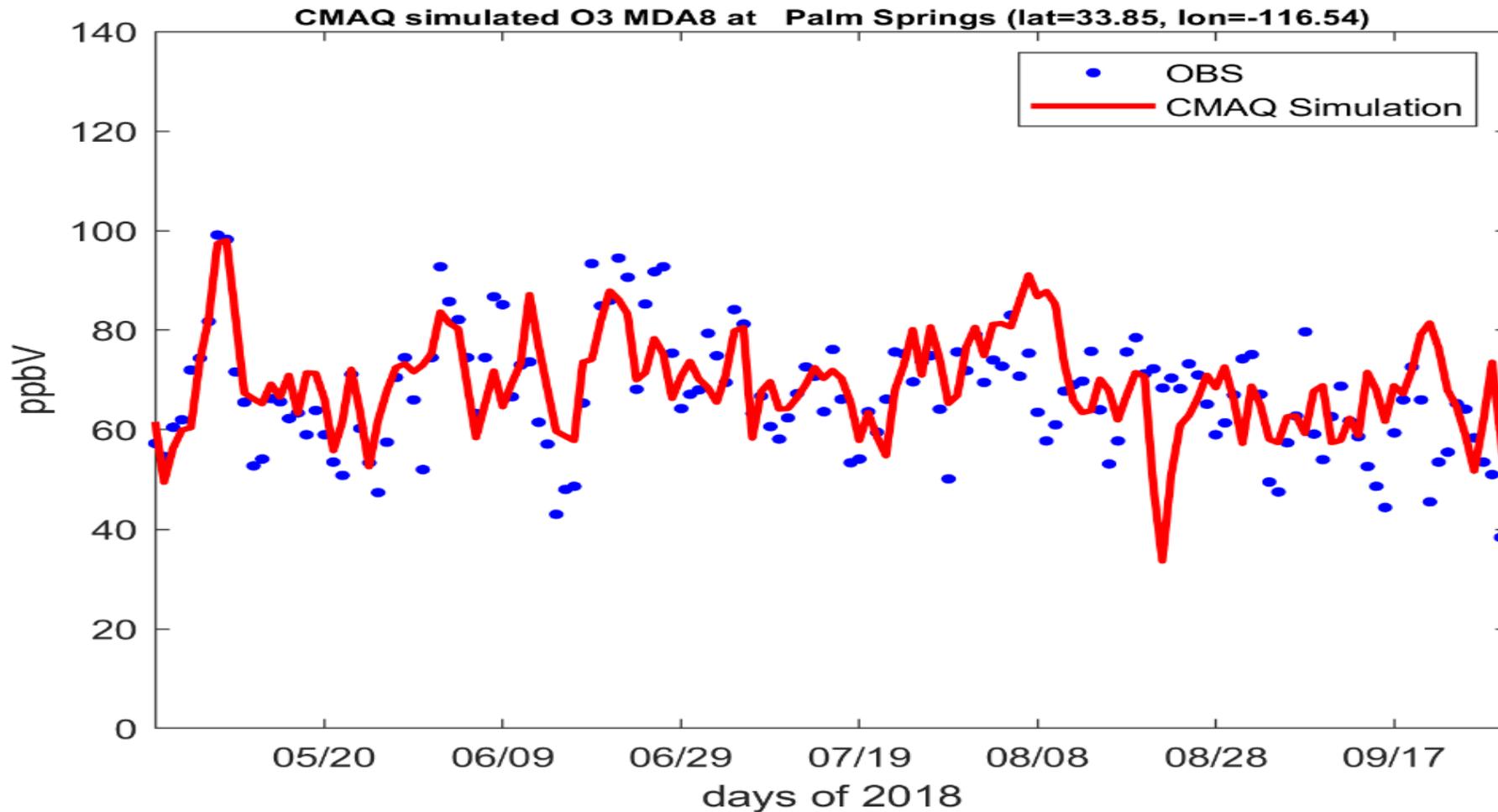


5-year Weighted Design Values

Monitoring Site	2016 AQMP DV Weighted for the period of 2010-2014	Current DV Weighted for the period of 2015-2019
Palm Springs	92	89.3
Indio	85	84.3

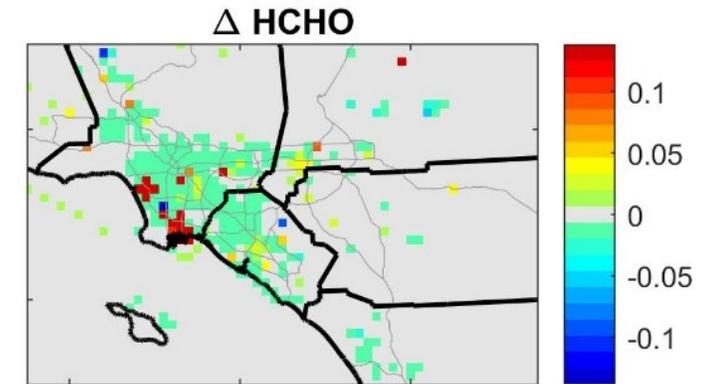
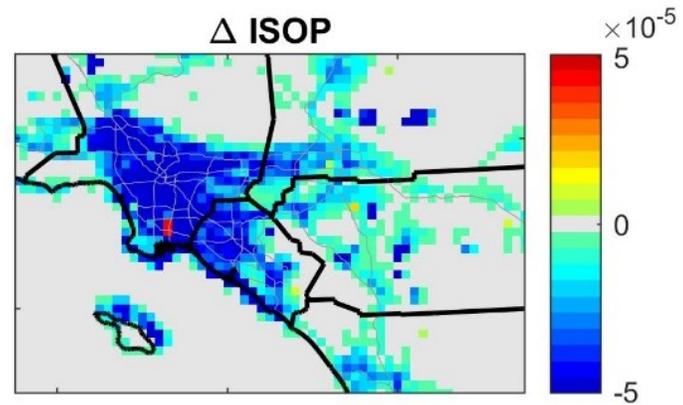
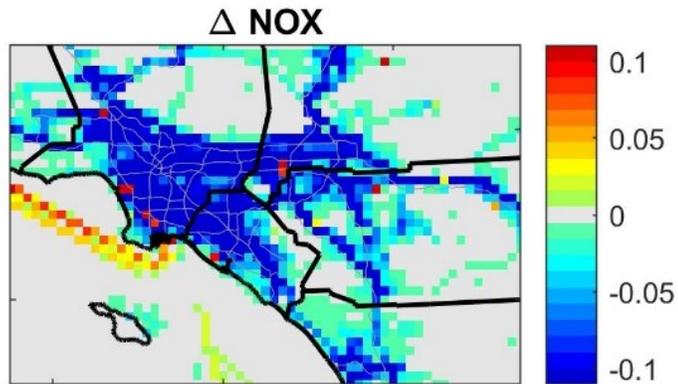


CMAQ Prediction vs Observation During 2018 Ozone Season



2023 vs 2018 Emissions Scenarios

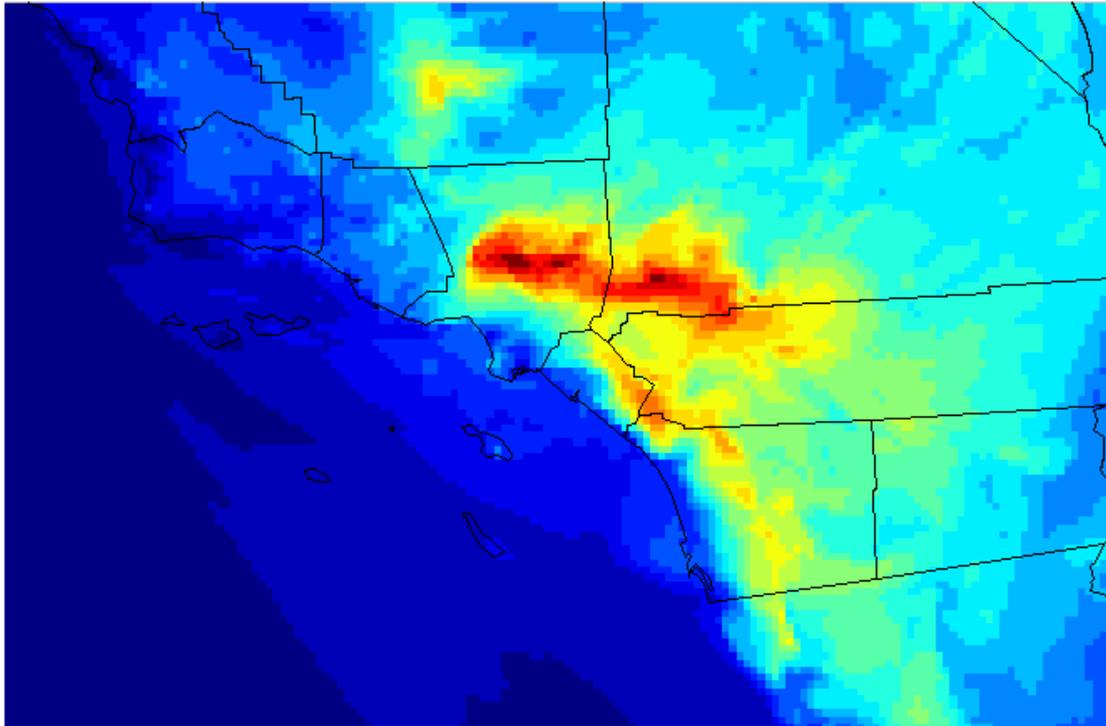
2023 minus 2018 during Ozone Season (tons/day)



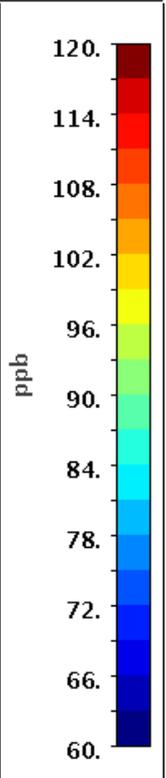
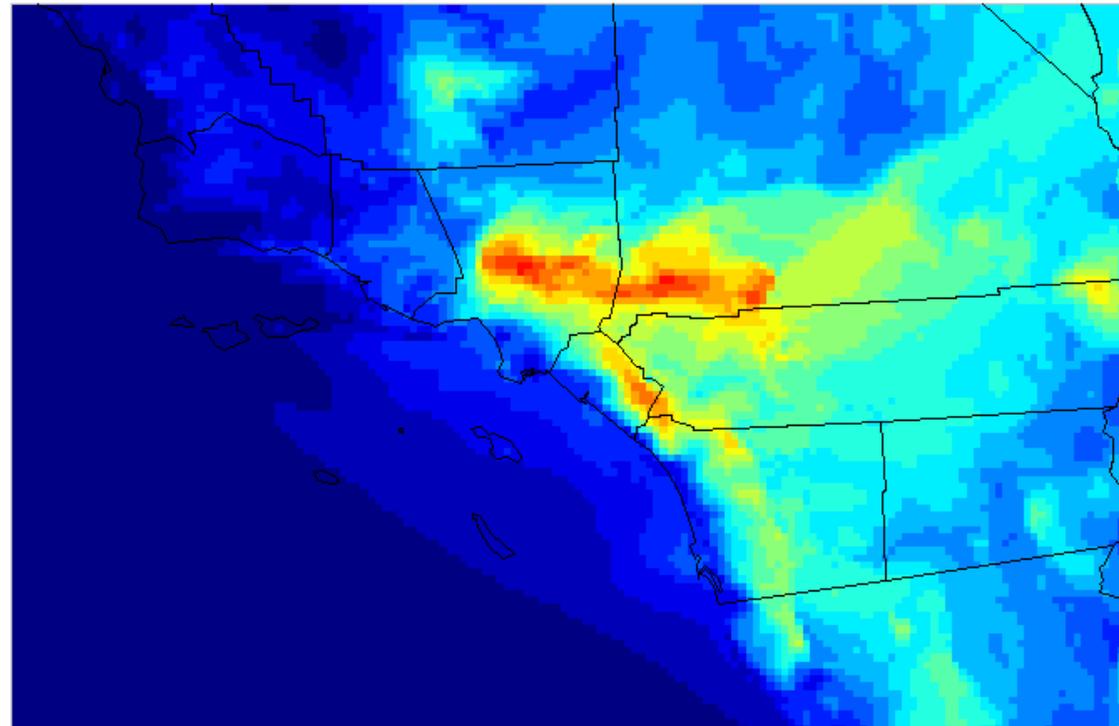
2023 vs 2018 CMAQ results

Maximum of MDA8 during Ozone Season

2018



2023



Base and Future Year Design Value

Station	2018	2023
Palm Springs	89.3	83.2
Indio	84.3	79.1



Summary and Conclusion

- Regional modeling platform and emissions inventory for Coachella Valley have been updated with latest available model versions and emissions data
- Coachella Valley is expected to attain the 1997 8-hour ozone standard in 2023 with reductions from continued implementation of existing regulations
- Preliminary modeling shows that Coachella Valley may attain even earlier (in 2022), but 2023 is retained as attainment year given uncertainties in meteorology, emissions inventory and modeling approach

